(4) **Today**

Section 1.2: Chemical Foundations

Sections 1.3: Physical-Chemical Foundations

Next Class (5)

Section 1.4: Genetic Foundations

Chap 2: Water and Its Role in Life

(6) **Second Class from Today**

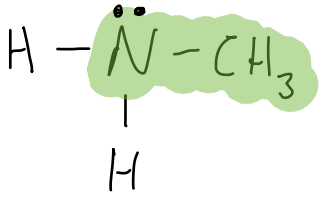
Chap 2: Water and Its Role in Life

Chap 3: Amino Acids, Peptides, and Proteins

Third Class from Today (7)

Chap 3: Amino Acids, Peptides, and Proteins

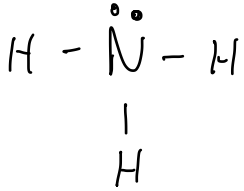
Amines



weak base

H-bond donor + acceptor

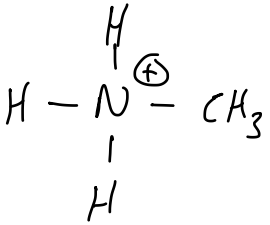
improves water solubility of alkyl groups (up to 3 C's) if NH bonds are present



weak base

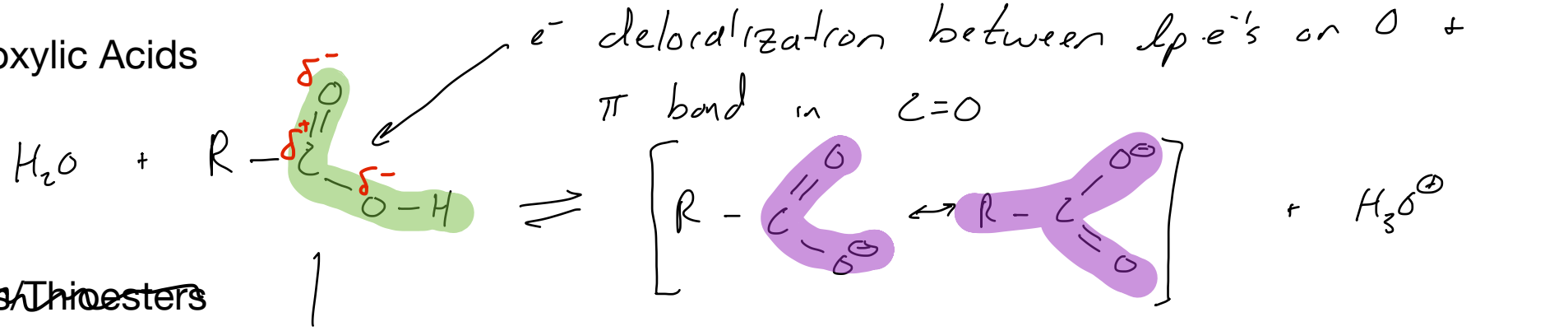
H-bond donor + acceptor

nucleophiles but at physiological pH they are protonated



so to use them as nucleophiles they have to be deprotonated

Carboxylic Acids



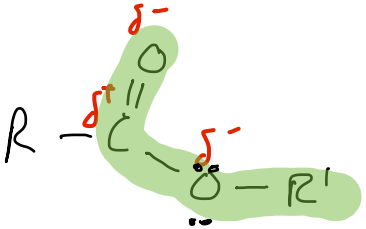
~~Esters/Thioesters~~

~~Amides~~

electrophilic C atom

~~Acyl Phosphates~~

~~Carboxylic Acids~~



H-bond acceptors

Interacts well with water similar solubility to alcohols

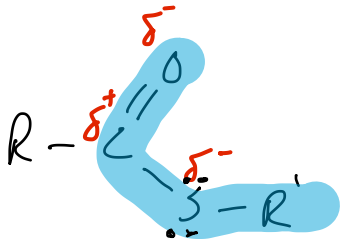
R' ≠ H R is a carbon containing group

Esters/Thioesters

the carbonyl C atom is electrophilic

the O atoms don't typically react as nucleophiles

~~Amides~~



lp e⁻ on ester O + thioester S are delocalized ... so stronger than a single bond, but S orbitals are in the n=3 shell. They don't interact as well as O's n=2 shell orbitals do with C's n=2 shell orbitals.

So thioesters are more reactive than esters

'R = H

~~Acyl Phosphates~~

~~Carboxylic Acids~~

H-bond donors + H-bond acceptors

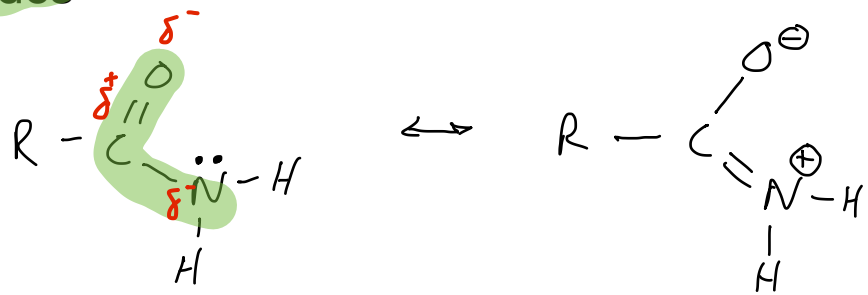
weakly basic ... not as basic as amines because e^- delocalization

~~Esters/Thioesters~~

weakly nucleophilic N atom

carbonyl C atom is electrophilic

Amides



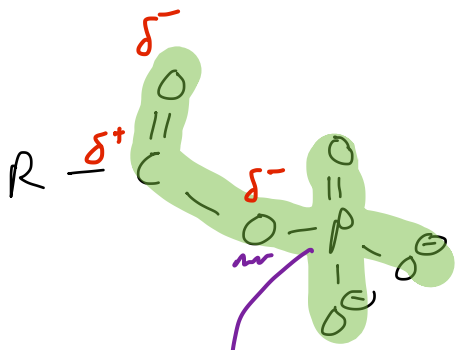
~~Acyl Phosphates~~

~~Carboxylic Acids~~

~~Esters/Thioesters~~

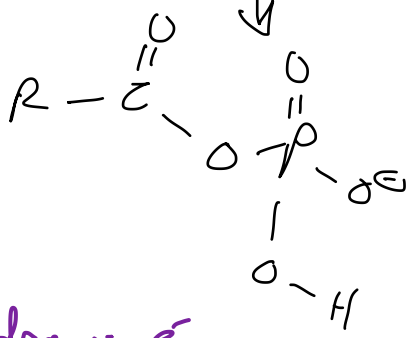
~~Amides~~

Acyl Phosphates



H-bond acceptors + donors

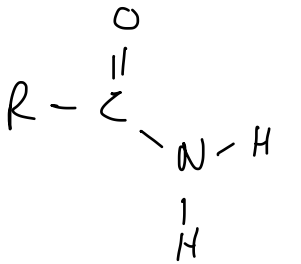
at physio pH

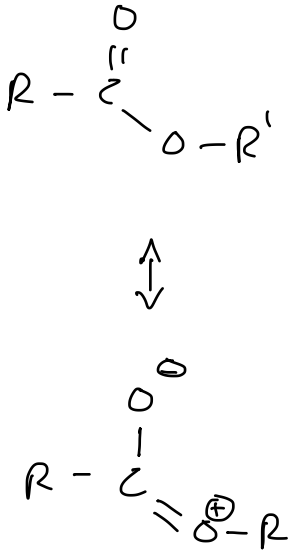


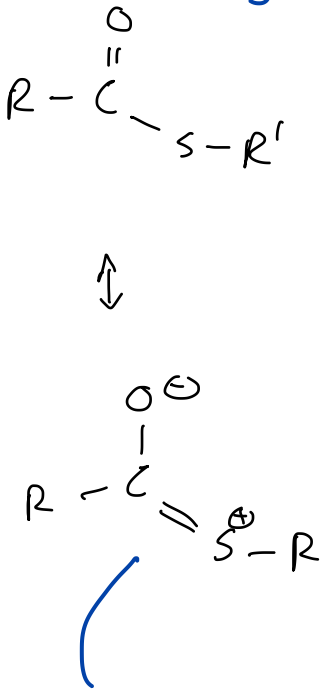
high oxidation state of P draws e⁻ density from O which in turn draws e⁻ density from the C.

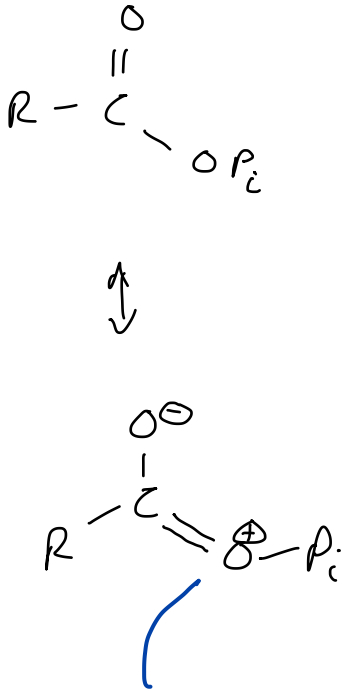
The C is electrophilic

increasing reactivity →









strongest bond
most π character
N can support ⊕ charge better than O

weaker than C-O or C-N because orbital size mismatch

this O atom is extra ⊕ because of the highly oxidized P atom next to it

P_i is shorthand for inorganic phosphate